

Nuclear Power in California: 2007 Status Report

2007 IEPR Committee
Nuclear Issues Workshop

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Topics

- ❑ CEC Nuclear Review
- ❑ Nuclear Power in California
- ❑ Storage/Disposal/Reprocessing Issues
- ❑ Economics of Nuclear Power
- ❑ Environmental and Societal Impacts
- ❑ Future of Nuclear Power
- ❑ Implications for California

CEC Nuclear Review

CEC Nuclear Review

- ❑ 1976: Legislation prohibits construction of new nuclear power plants until CEC finds:
 - U.S has approved, and there exists a technology for the construction and operation of, nuclear fuel rod reprocessing plants
 - U.S. has approved and there exists a demonstrated technology or means for the disposal of high-level nuclear waste
- ❑ 1977-1978: CEC holds hearings, investigation; concludes these findings can not be made
- ❑ 2005: As part of IEPR 2005, CEC commissions status report, holds workshops; reaffirms 1978 conclusions

Nuclear Power in California

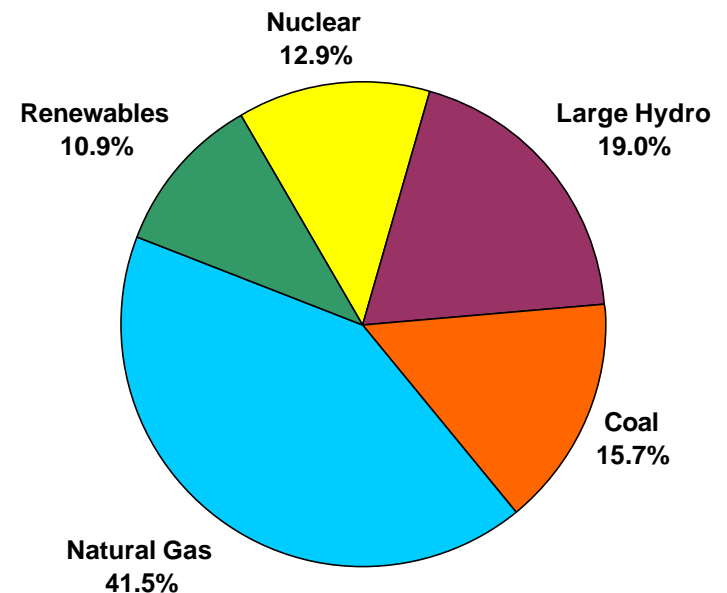
Nuclear Power in California

1976: Legislation prohibited construction of new nuclear power plants in California until the federal government approves a technology for high-level waste disposal and/or spent fuel reprocessing

1978: Commission found that these conditions were not met

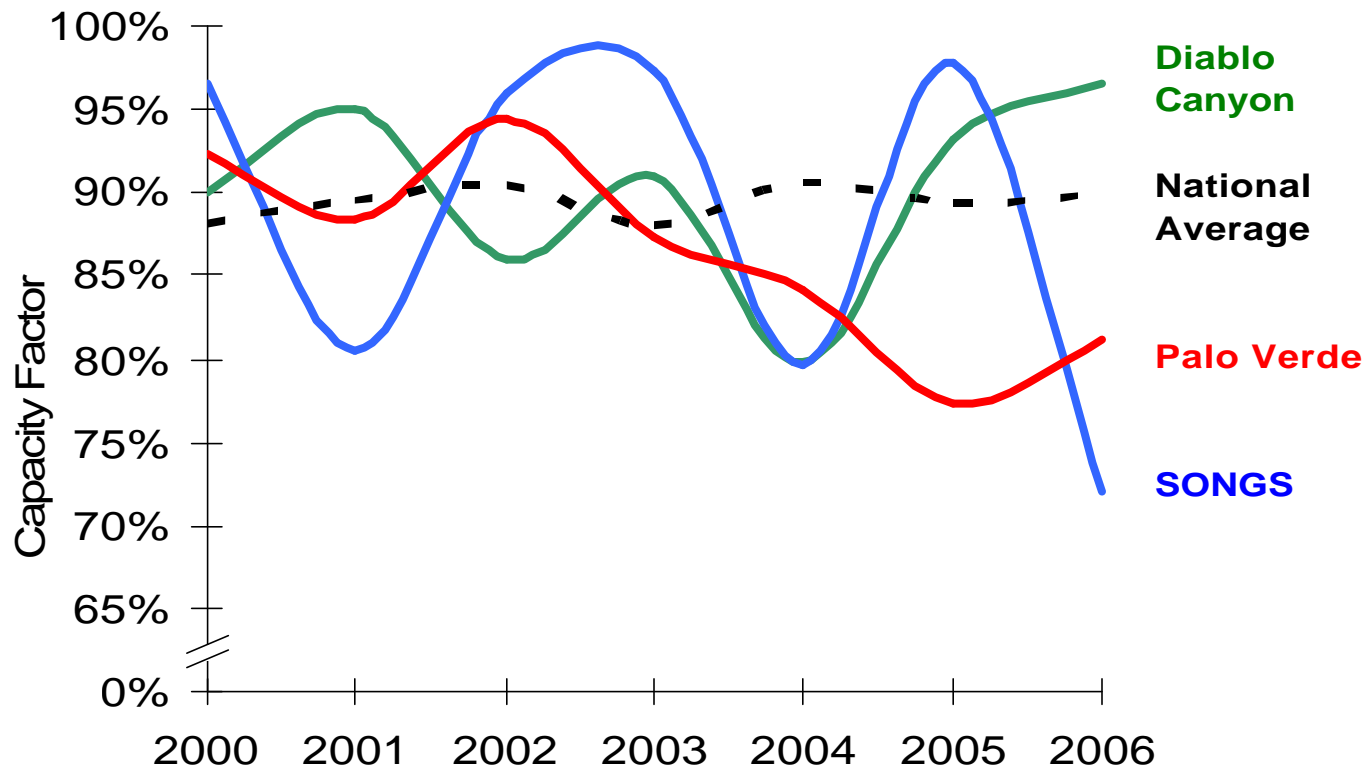
2005: CEC commissions status report, holds workshops; reaffirms 1978 conclusions

California 2006 Electricity Mix



Source: Energy Commission, 2007

2000-2006 Capacity Factors



- Diablo Canyon: High availability 2005-2006
- SONGS: Low availability 2006
- Palo Verde: Below national average since 2003

Storage/Disposal/ Reprocessing Issues

Status of Yucca Mountain Repository

| | |
|-------------------------------------|-------------|
| License application submission date | June 2008 |
| Best-achievable opening date | 2017 |
| More likely opening date | 2020 - 2021 |

- ❑ Final EPA standards not yet released
- ❑ DOE-proposed Yucca Mountain legislation proposal was not voted on in 2006
- ❑ Projected opening postponed by 5 years since 2005 review

Status of Yucca Mountain Repository

“As I prepare to depart the commission later this year, the opening of the repository is if anything more distant than when I arrived [in 1996] and it is absolutely dependent on the passage of legislation that currently has no chance of enactment.”

-NRC Commissioner McGaffigan

DOE Nuclear Waste Fund Litigation

| Utility | Damages Claimed | Status |
|---------|---------------------------------|---|
| PG&E | \$92.1 million, through 2004 | Awarded \$42.8 million, appealed by PG&E and DOE |
| SCE | \$105 million, through 2005 | Trial date TBA |
| SMUD | \$79 million, through 2003 | Awarded \$40 million, appealed by SMUD and DOE |
| APS | \$94 million, through 2006 | Trial date TBA |

On-Site Interim Storage

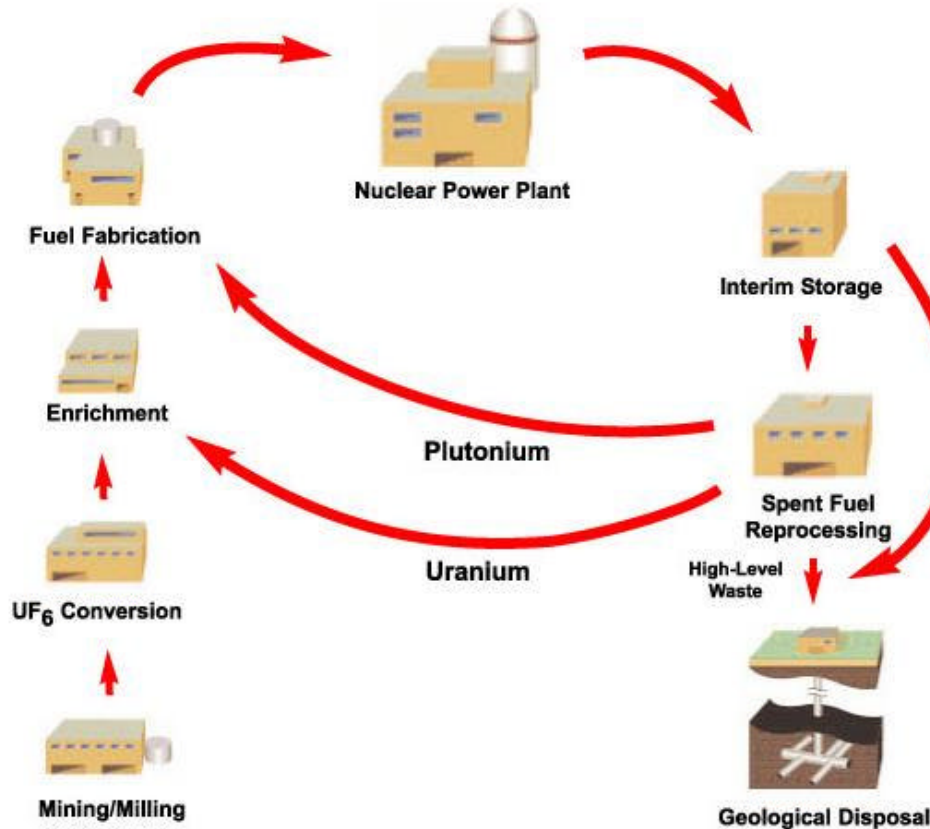
Dry Cask Storage Facilities

| Location | Status | Operational |
|---------------|---------------------|-------------|
| Diablo Canyon | Under Construction* | Late 2007 |
| SONGS | Operating | 2003 |
| Humboldt Bay | Under Construction | Spring 2008 |
| Rancho Seco | Loading Complete | 2002 |

*The Diablo Canyon ISFSI license is being litigated

- ❑ Spent fuel pools approaching capacity
- ❑ Diablo Canyon dry cask storage litigation
 - Per court order, NRC preparing supplemental EIS on terrorism impacts
 - NRC to issue decision early 2008

Global Nuclear Energy Partnership

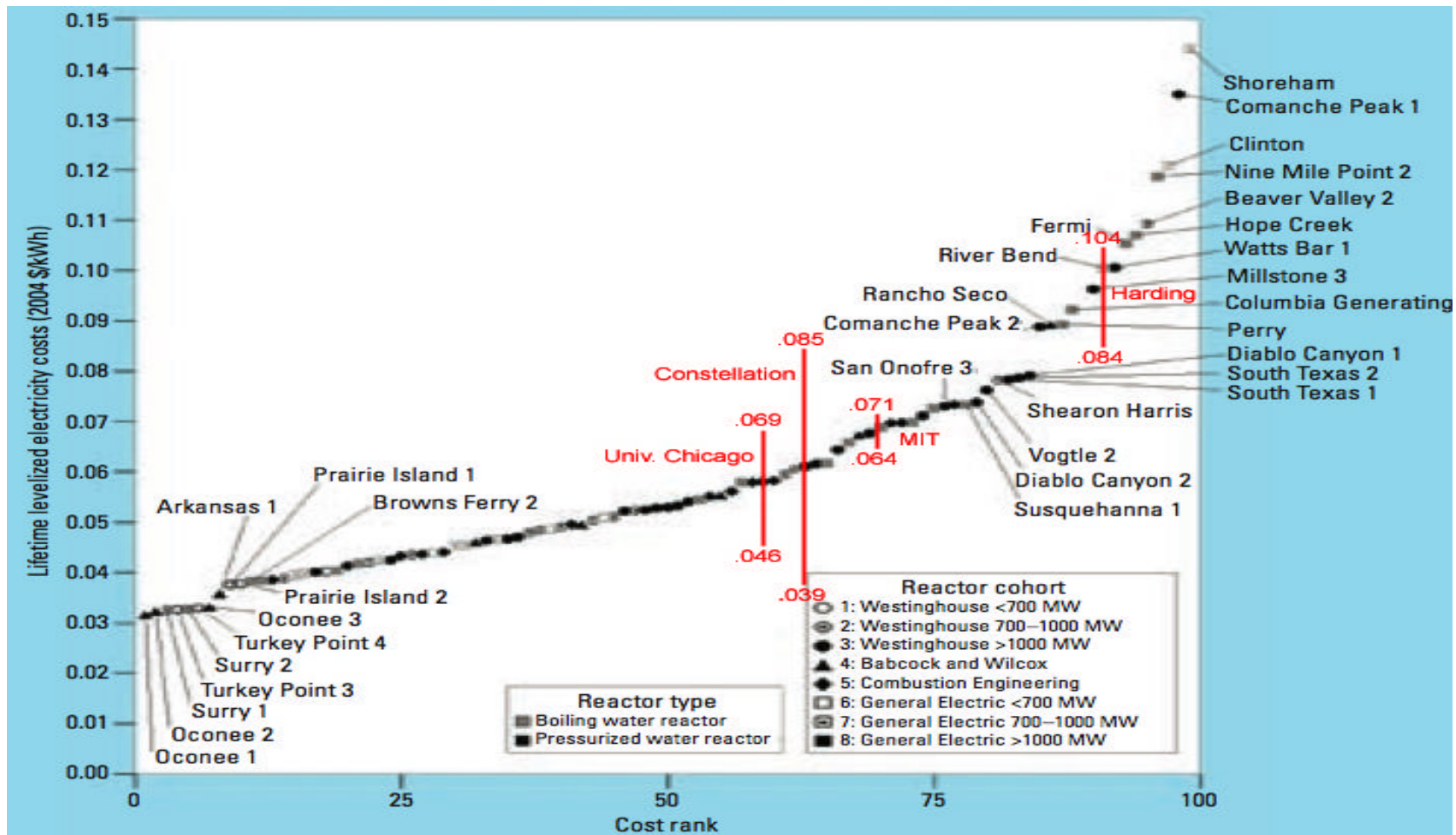


- ❑ Could defer need for a second repository (by leaving more material aboveground?)
- ❑ Timeline and program specifics remain uncertain
- ❑ Potential environmental and safety impacts
 - Nonproliferation
 - Higher accident rate for reprocessing
 - Long term interim storage at reprocessing facility
 - New reactor designs
 - Multiple transport links

Source: Uranium.info

Economics

Levelized Costs of Operating Reactors/ Estimates for **New Reactors**



Source: Hultman et.al. overlaid with recent estimates of future costs

Cost Drivers for New Plants

Down

- EPAct subsidies
- Combined Operating License process
- Standardized reactor designs
- Lower interest rates and inflation than first generation plants

Up

- Potential “Chokepoints”
 - ▣ Uranium
 - ▣ Materials
 - ▣ Labor
- New technologies
- Overseas constructors with limited U.S. experience

Environmental and Societal Impacts

Environmental Impacts

- ❑ Lifecycle greenhouse gas emissions
 - Not zero but substantially lower than fossil-fueled power
- ❑ Once-through cooling
 - Diablo Canyon and SONGS: Roughly 5 billion gallons of ocean water per day
- ❑ Other impacts:
 - Mining and milling
 - Uranium enrichment
 - Transport/storage/reprocessing
 - Tritium leaks at several plants including Palo Verde and SONGS 1

Future of Nuclear Power

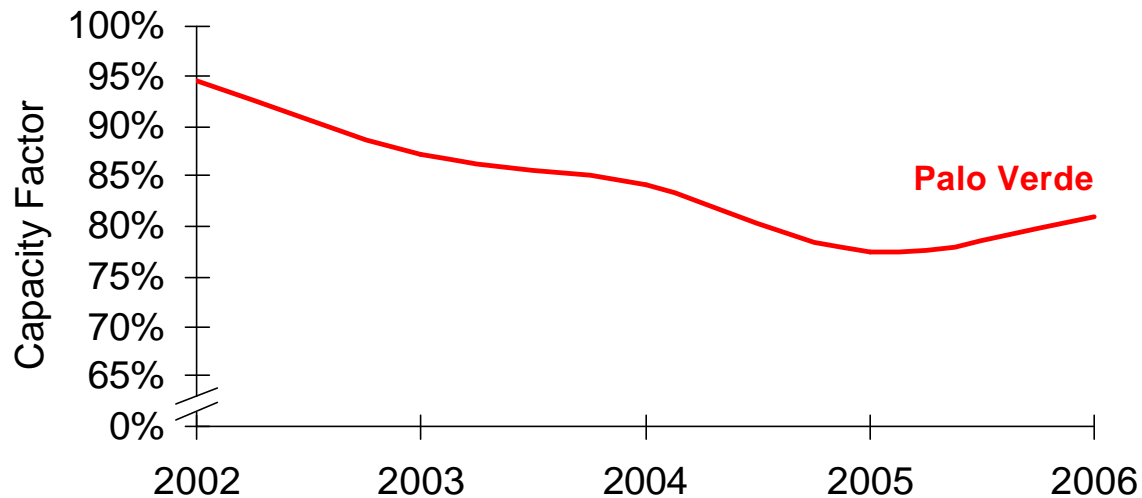
License Renewals

| Unit | Capacity | License Expiration Date |
|------------------|----------|-------------------------|
| Diablo Canyon #1 | 1,087 MW | November 2, 2024 |
| Diablo Canyon #2 | 1,087 MW | August 26, 2025 |
| SONGS #2 | 1,070 MW | February 16, 2022 |
| SONGS #3 | 1,080 MW | November 15, 2022 |

- PG&E has begun renewal feasibility study
- PG&E to seek CPUC approval before submitting license renewal application
 - CPUC expects to make decision in 2013

Palo Verde Performance

- ❑ Multiple reactor trips and unplanned outages since 2004



- ❑ NRC demotion: Multiple/Repetitive Degraded Cornerstone (Unit 3)
- ❑ Problem areas: human performance, problem identification and resolution, and safety culture

Potential Implications for California

Spent Fuel Continues to Accumulate

- ❑ Now 2,437 tons in on-site storage in CA
- ❑ California utilities continue to pursue breach of contract suits against DOE
- ❑ ISFSIs in operation or under construction at all CA reactors

Reprocessing

- ❑ Driven by non-proliferation policies
- ❑ GNEP proposal still uncertain
- ❑ Technology choices still to be made
- ❑ May result in more radioactive material above ground, in transit
- ❑ Costs appear uncompetitive with once-through
- ❑ Possibly part of a long-term (50 years-plus) industry structure

Nuclear Waste Transport

- ❑ Transport routes being considered could result in disproportionate number of shipments through California
 - DOE has for the most part not been responsive to California's route selection concerns
- ❑ California has not adjusted its nuclear waste transport fees, as recommended in the 2005 IEPR

Policy Questions for Workshop

- ❑ What are implications of spent fuel storage and disposal delays?
- ❑ What do federal reprocessing initiatives imply for California?
- ❑ Are there recent or expected operational issues of concern to California?
- ❑ What are the emerging environmental, safety and economic issues that will affect the role of nuclear power in California?
 - Greenhouse gas emissions
 - Security and terrorism risks
 - Economics of new nuclear development

Written comments from interested parties should be submitted no later than July 13, 2007. Please see the Workshop Notice for submission guidelines.